

STRATEGIC MARKET PERSPECTIVE

Client/Server Trends in the Federal IT Market:

1994

Federal Market Analysis Program

M A Y 1 9 9 4

Client/Server Trends in the Federal IT Market: 1994

INPUT
LIBRARY

INPUT®

Frankfurt • London • New York • Paris • San Francisco • Tokyo • Washington, D.C.

Clients make informed decisions more quickly and economically by using INPUT's services. Since 1974, information technology (IT) users and vendors throughout the world have relied on INPUT for data, research, objective analysis and insightful opinions to prepare their plans, market assessments and business directions, particularly in computer software and services.

Contact us today to learn how your company can use INPUT's knowledge and experience to grow and profit in the revolutionary IT world of the 1990s.

SUBSCRIPTION SERVICES

- **Information Services Markets**
 - Worldwide and country data
 - Vertical industry analysis
- **Business Integration Markets**
- **Client/Server Applications and Directions**
- **Client/Server Software**
- **Outsourcing Markets**
- **Information Services Vendor Profiles and Analysis**
- **EDI/Electronic Commerce**
- **U.S. Federal Government IT Markets**
- **IT Customer Services Directions (Europe)**

SERVICE FEATURES

- Research-based reports on trends, etc. (Over 100 in-depth reports a year)
- Frequent bulletins on events, issues, etc.
- 5-year market forecasts
- Competitive analysis
- Access to experienced consultants
- Immediate answers to questions
- On-site presentations
- Annual conference

DATABASES

- **Software and Services Market Forecasts**
- **Software and Services Vendors**
- **U.S. Federal Government**
 - Procurement Plans (PAR)
 - Forecasts
 - Awards (FAIT)
- **Commercial Application (LEADS)**

CUSTOM PROJECTS

For Vendors—analyze:

- Market strategies and tactics
- Product/service opportunities
- Customer satisfaction levels
- Competitive positioning
- Acquisition targets

For Buyers—evaluate:

- Specific vendor capabilities
- Outsourcing options
- Systems plans
- Peer position

OTHER SERVICES

Acquisition/partnership searches

INPUT WORLDWIDE

Frankfurt

Sudetenstraße 9
D-35428 Langgöns-
Niederkleen

Germany

Tel. +49 (0) 6447-7229

Fax +49 (0) 6447-7327

London

17 Hill Street
London W1X 7FB
England

Tel. +44 (0) 71 493-9335

Fax +44 (0) 71 629-0179

New York

400 Frank W. Burr Blvd.
Teaneck, NJ 07666
U.S.A.

Tel. 1 (201) 801-0050

Fax 1 (201) 801-0441

Paris

24, avenue du Recteur
Poincaré
75016 Paris

France

Tel. +33 (1) 46 47 65 65

Fax +33 (1) 46 47 69 50

San Francisco

1881 Landings Drive
Mountain View
CA 94043-0848
U.S.A.

Tel. 1 (415) 961-3300

Fax 1 (415) 961-3966

Tokyo

Saida Building, 4-6,
Kanda Sakuma-cho
Chiyoda-ku, Tokyo 101
Japan

Tel. +81 3 3864-0531

Fax +81 3 3864-4114

Washington, D.C.

1953 Gallows Road
Suite 560
Vienna, VA 22182
U.S.A.

Tel. 1 (703) 847-6870

Fax 1 (703) 847-6872

Abstract

Client/server architectural principles for systems development have become increasingly popular as a systems design approach. The technology marketplace has and will continue to respond with new and revised products and services. This report reviews the extent to which client/server systems are introduced in the federal sector and the implications of their expanding use. This review is based on a recent survey of federal Information Resources Management (IRM) executives to determine current and planned uses of client/server architecture and its perceived benefits and challenges.

Distributing application systems is not a recent notion. However, *client/server*—the distribution of presentation, process and data management among a network of high-performance micro-processors—is a new implementation paradigm for distributed systems. This paradigm poses new challenges for the information technology community in assimilating new methods and technology and in integrating new architectures with legacy operations. Accordingly, the client/server revolution has a profound effect on development practices, tools and operational environments.

Based on a survey of federal IRM management, the most significant benefits related to client/server architecture implementation are an installed base of desktop computing power and the ability to distribute data along with associated functionality to users. Distribution of data and function occurs on a geographic and organization basis. Client/server architecture as a system paradigm, has also fostered the use of open systems. The associated benefits and standards significantly affect the federal systems integration market. An increasing proportion of the IRM budget is dedicated to systems with a client/server paradigm. Further, perceived benefits of client/server architecture are intermeshed with downsizing computers and organizations and with the greater economic achievement in the information technology.

This report contains 82 pages, including 33 exhibits.

Published by
INPUT
1881 Landings Drive
Mountain View, CA 94043-0848
United States of America

**Federal Information Technology
Market Program**

***Client/Server Trends in the
Federal IT Market: 1994***

Copyright © 1994 by INPUT. All rights reserved.
Printed in the United States of America. No part of the
publication may be reproduced or distributed in any
form, or by any means, or stored in a database or
retrieval system, without the prior written permission of
the publisher.

The information provided in this report shall be used
only by the employees of and within the current
corporate structure of INPUT's clients, and will not be
disclosed to any other organization or person including
parent, subsidiary or affiliated organization without prior
written consent of INPUT.

INPUT exercises its best efforts in preparation of the
information provided in this report and believes the
information contained herein to be accurate. However,
INPUT shall have no liability for any loss or expense
that may result from incompleteness or inaccuracy of
the information provided.

Table of Contents

I

Introduction	I-1
A. Scope	I-1
B. Objectives	I-2
C. Definitions	I-2
D. Methodology	I-4
E. Report Structure	I-5

II

Executive Overview	II-1
A. Management Perspective	II-1
B. Today's Environment	II-2
C. Client/Server Capabilities	II-4
D. Matching Capabilities to Needs—The Vendor View	II-5
E. Related Issues	II-6

III

Survey Findings	III-1
A. Use of Client/Server Architecture	III-2
B. Scope and Significance of Client/Server Architecture	III-3
C. Integration With Current Operations and Legacy Systems	III-4
D. Importance of Open Systems for Client/Server Implementation	III-5
E. Expected and Realized Benefits	III-6
F. Expected and Experienced Disadvantages	III-7
G. Critical Success Factors for Client/Server Implementation	III-9
H. Obstacles to Client/Server Implementation	III-10
I. Source of Staffing Support	III-11

III

J. Source of Development Tools	III-11
K. Use of Commercial Off-The-Shelf Software	III-12
L. Type Of Platform Used	III-12
M. Client/Server Funding Trend	III-14
N. Other Factors Influencing Client/Server Usage	III-14

IV

Findings and Recommendations	IV-1
A. General Observations	IV-1
B. Recommendations	IV-3
1. Restructuring of Operations	IV-3
2. Need for Economies in Operational Costs	IV-3
3. Downsizing of Operations and Platforms	IV-4
4. Concern About Control of Data and Operations	IV-4
5. Executive Commitment and Expectation	IV-5
6. Funding Trends	IV-6
7. External Support Needs	IV-7

V

Market Forecast	V-1
-----------------	-----

Appendixes

A. List of Agencies and Survey Respondents	A-1
B. Related INPUT Reports	B-1
C. Questionnaire	C-1
A. Survey Letter	C-1
B. Questionnaire	C-2

Exhibits

III

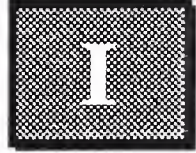
-1 Client/Server Activity	III-2
-2 Scope of Client/Server Implementation	III-3
-3 Significance of Client/Server Development	III-4
-4 Integration of Client/Server Applications with Legacy Systems	III-5
-5 Significance of Open System Principles in Client/Server Applications	III-5
-6 Expected Client/Server Benefits	III-6
-7 Experienced Client/Server Benefits	III-7
-8 Expected Client/Server Disadvantages	III-8
-9 Experienced Client/Server Disadvantages	III-8
-10 Critical Successful Factors	III-9
-11 Client/Server Obstacles	III-10
-12 Staffing Support	III-11
-13 Software Support	III-11
-14 Use of Commercial Off-The-Shelf Software	III-12
-15 Development Platform Type	III-13
-16 Operation Platform Type	III-13
-17 Information Technology Funding	III-14
-18 Factors Influencing Client/Server Usage	III-15

IV

-1 Federal Government Client/Server Market Growth	V-2
-2 Projected Expenditures for Software Including Acquisition and Licenses	V-2
-3 Forecast Expenditures for Software Development Through Professional Services	V-4
-4 Forecast Expenditures for Systems Integration	V-5

IV

-5	Client/Server Implementation Tools	V-6
-6	Representative Team Engineering Tools	V-7
-7	Representative Re-engineering Tools	V-8
-8	Representative CASE Analysis and Design Tools	V-9
-9	Representative 4GL Development Environments	V-10
-10	Representative GUI Development Tools	V-11
-11	Representative Database Management Systems	V-12
-12	Representative Data Access Tools	V-13
-13	Representative Decision Support Systems	V-14
-14	Representative Systems Management Products	V-14
-15	Representative Network Management Products	V-15



Introduction

This report and the related research were performed as part of INPUT's Federal Market Analysis Program. This program supports the management of leading vendors in the information services industry and the information systems function of the federal government.

The report contains a review of the current and projected use of Client/Server as an architecture for the design and implementation of application systems in the federal sector. This review is based on a recent survey of federal IRM executives to determine the current and planned use of client/server architecture and the perceived benefits and challenges associated with its use.

On the assumption that better knowledge of its customer needs will enhance the vendor community's support to the federal sector, this report provides the vendor community with a better understanding of current and projected use of client/server architecture. The report also has been provided to organizations in the federal sector who participated in the survey to acquaint them with activities and perceptions of their counterparts in other agencies.

A

Scope

This report examines use of client/server architecture in the federal government. The focus of the report is on:

- Present and planned usage of the architecture in developing application systems
- Perceived benefits of the client/server architecture for the development and operation of application systems

- Critical success factors and obstacles to client/server architecture
- Vendor opportunities to support client/server architecture and supporting products and services

B

Objectives

This report will address the following questions:

- Is there a clear definition of the concepts of client/server architecture in the federal government technology environment?
- To what extent is client/server architecture used in current systems projects?
- How will client/server use change in the next three years?
- What are the benefits expected by the federal community in adopting client/server architectures?
- What benefits have actually been obtained through client/server implementations?
- What barriers hinder the client/server model for systems design and implementation?
- What are the implications of these barriers to vendors of support services and technology?
- How can vendors facilitate the implementation of their products and services?
- What is the size of the client/server market and how will it expand over the next five years?
- What are the characteristics of new vendors and products entering the client/server market?

C

Definitions

Definitions of the term *client/server* vary widely from user to user and vendor to vendor. This report uses the context of application

systems where use of *client* and *server* terminology denotes a separation of functional components. In this context, the role of a server is to provide certain functionality to all other components of the system. As an example, a server, in the form of a single program or system component, provides data management for all activities of an application or set of applications. In this illustration, the server provides the capability for all access to and storage of data needed by programs providing functional capability. Such programs are considered clients of the data server. Similarly, a single component that provides network access and connectivity for functional programs is a server for that set of client programs.

In the distributed systems context typically used in client/server references, clients and servers are distributed in a network of processors, usually with geographic dispersion of the clients in the form of intelligent workstations supported by PC platforms.

Based on this general frame of reference, today's implementation of client/server architecture is physically implemented using multiple processors, each supporting specific system sub-functions, often dispersed geographically and interconnected by a data communications network.

In this definition, servers typically provide common support for data and communications management for utility functions such as printing and systems management support. In a complex open systems context, disparate technology can be employed for various system subfunctions, such as:

- Fully redundant, real-time data communications handlers
- Computer-intensive processing using massively paralleled computers
- Common data storage repositories providing enterprise-wide information sharing and intelligent workstations that support local data storage
- Computing with graphical user interfaces and sophisticated data presentation capabilities

Beyond this generic view of a client/server architecture, the definition of other terms used in this report are:

Client—A system component that provides specific and limited functionality and supports user activities

Server—A system component with responsibility for a particular system subfunction such as data management or communications network interface

Enterprise—The entire organization for which a system provides specific functional support; in this context, an enterprise is usually supported by a variety of systems having to do with its overall mission and its administrative support

Open systems—Implementation of nonproprietary technology that provides for interoperability, portability, scalability and extensibility

D

Methodology

This report was developed from survey data collected from management staff of selected federal departments and agencies. Initial contact was made at the agency IRM executive level. In most instances, subsequent interviews were held with subordinate staff.

Interviews were structured but allowed to range over issues related to client/server based on the interviewee's perspectives and interests. Information about each respondent's systems development activity and planned projects was solicited and discussed. As outlined in the Findings section, survey participants were asked about the current and future systems development activities and to what degree client/server architecture would be a factor. Participants were asked if the client/server paradigm was applicable to their organization's needs and what benefits its use would provide.

Relative to their own enterprise, participants were asked what actions were or might be necessary to obtain the expected benefits from client/server systems. Participants were then asked how they thought the vendor community could best support their efforts in developing and implementing client/server solutions.

Finally, participants were asked to identify other issues or trends they believed were significant to their use of client/server as a system architecture.

Tabulations of question responses are presented in the Findings section.

In addition to the primary input from department and agency sources, the secondary sources of information for this report include the following:

- Interviews with vendors of client/server-related services and technology products
- Interviews with standards organizations
- Nonproprietary insights from custom research and consulting studies
- Ongoing interaction with technical experts and practitioners

E

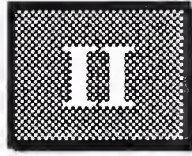
Report Structure

Following this Introduction section is an Executive Overview that provides a comprehensive inspection of client/server as a concept and how it is used in current systems development activities. This section also provides an overview of findings and recommendations detailed in subsequent sections of the report.

The third section of the report, Survey Findings, presents specific information obtained from interviews with the departments and agencies of the federal government. These interviews were conducted to determine the use and significance of the client/server concept for current and planned projects and its future implementations.

The Findings and Recommendations section of the report presents observations based on the survey findings, draws conclusions relative to the issues and needs of the federal marketplace and offers recommendations to the vendor community.

The final section of the report, Market Forecast, estimates the federal government's client/server market size over the next five years and cites the type of products currently introduced.



Executive Overview

This report and the related research were performed as part of INPUT's Federal Market Analysis Program. This program serves the management of leading vendors in the information services industry and the information systems function of the federal government.

A

Management Perspective

Client/server is a catch-all phrase for a host of new technology developments. Its use has been enabled by the exploding power of the desktop microcomputer and graphical user interfaces that provide windowed presentation with point-and-click technology. The expanding use of relational data management systems, coupled with improved network connectivity to mainframe and other data sources, has provided interactive users a full computing environment within arm's length.

Client/server architecture does more than connect user capabilities to a larger host computing environment. In a redistribution of capability, the client/server relationship integrates the user client platform with the host, acting in a server role on a more cooperative relationship. The implementation of the client/server design has led to networked processors sharing functions of computing, data storage and presentation.

Client/server architecture, implemented using open systems standards, provides a means of integrating technology more oriented to competitive price/performance criteria in lieu of the compatibility constraints imposed by proprietary systems. Taken together, the promise of shortened development cycles at a reduced cost, lower operational costs through increased product choices and price competition, and better integration of the

information and technology assets of the enterprise provide a powerful motivation to adopt the client/server model as a system design and implementation strategy.

However, as the findings highlight, the evolution to client/server implementation is not an easy one. It requires a more holistic view of processing and data distribution, including capabilities and limitations of the network and distributed platforms. This different view and the supporting technologies impact on the culture and capabilities of the technical and user staff. Further, the integration of the new paradigm with existing and ongoing legacy systems provides significant management and technical challenges.

B

Today's Environment

As the general public is aware, the economic forces at work in the federal sector have generally created a fiscal environment where government downsizing and corresponding cost reductions have curtailed most discretionary spending on new technology initiatives. In particular, the curtailment of Department of Defense (DoD) spending, the primary source of new technology assessment and confirmation for many smaller civilian agencies, has served to further reduce research and development initiatives.

The emphasis on existing program efficiencies creates increased competitive pressures for further economies. This cost-cutting atmosphere and continual shake-out of government contractors does not foster an environment conducive to investment in new methods requiring significant start-up costs.

The current state of large-scale systems development is all too familiar. Large and small organizations find their budgets for system development inadequate to meet demands. The availability and growing use of commercial-off-the-shelf software have improved the responsiveness to core business needs, but have done little to offset increases in demand.

Nor has information engineering disciplines and supporting products provided large organizations with significant breakthroughs in productivity to meet the demand for new systems. In fact, expanding the view of systems development

needs to an enterprise-wide understanding creates a more pessimistic view of the systems development function's support for the growing demands of the organization. Perhaps in response to the increased structure and organizational commitment of more formal methodologies, other development techniques such as prototyping, rapid application development (RAD) and joint application development (JAD) shorten the development cycle.

The dilemma of systems development cost and cycle time continues in spite of the burgeoning variety and increased capabilities of CASE tools and distribution of the development efforts to local, dedicated platforms.

User computing, once thought of as an extension of the mainframe capability to the user by means of user-friendly languages and tools, has been redefined by the desktop computer. The personal computer has rapidly evolved to a desktop workstation with significant data storage and processing power, frequently surpassing the capabilities of yesterday's mainframe.

In terms of data sharing and network interconnectivity, this user environment often operates independently from the enterprise, characterized by separate program libraries and redundant data. This environment created runaway information technology costs for the enterprise so, while increasing individual user or department capacities, has led to a total far less than the sum of its parts. In fact, from an enterprise view, problems relating to data integrity, cost of equipment, software and support and overall technology coordination have become worse as a result of unbridled growth in desktop processing capability.

To many organizations, the client/server paradigm offers promise as a means of harnessing and integrating the capabilities of the desktop proliferation. Client/server architecture serves as a model for distributing capabilities for increased data access and processing capability. It offers a means for parochial processing needs without subverting enterprise data integrity, and allows sophisticated graphical user interfaces to enhance ease of use. Client/server provides a distributed processing capability to specific users to maintain cost as a function of incremental benefit. It provides a more modular construct for development efforts with better implementation flexibility (holding promise for easier incremental growth), shortens development time for

individual functionality and reduces maintenance costs over the full system life cycle.

C

Client/Server Capabilities

The findings show that IRM management is convinced that client/server implementations will benefit their operation and mission support in a number of significant ways. The following benefits were cited most often:

- Operational economies
- Improved data availability
- Exploitation of desktop capability
- Improved efficiency
- Greater flexibility
- Better performance

By a wide margin, the benefit cited most frequently was operational economies. The focus on costs and cost reduction was a consistent reference by participants in the study, and reflects issues facing agency and IRM executives today.

The reported successes of client/server implementations was encouraging. An ingredient in the benefit of improved operational economies was that client/server implementations integrated and exploited the capability of the desktop.

The leading responses to what were critical success factors to implement client/server included:

- Providing effective data access, integrity and security
- Obtaining user buy-in and involvement
- Reducing operating costs
- Using methodologies and standards
- Gaining and keeping management commitment and budget support

D

Matching Capabilities to Needs—The Vendor View

Inherent in offering any new product or service, the successful vendor must provide the functional capability and meet user needs at a competitive price. However, in introducing products or services using new technology, the vendor must relate to the obstacles the customer faces in adopting the technology. Appropriate vendor support is particularly critical to the customer's success, especially if the technology must be intimately understood by the user to gain its full benefit.

To be successful in such situations, leading vendors must help the customer address the technology transfer needs and provide assistance in removing obstacles the customer faces. Implicitly, these factors are also barriers to the acquisition and use of vendors' products and services.

The obstacles faced by federal users in implementing client/server architectures include:

- Staff attitudes and learning curves
- Investments in the existing infrastructure
- Need to understand and re-engineer operational functions
- Integration with existing technology
- Data access/integration complexity
- Organization boundaries
- Lack of standards
- Management understanding and acceptance
- Performance impact on installed capacity

E

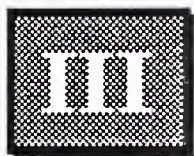
Related Issues

The issues facing the federal agencies have never been more daunting. The survey shows IRM management has a range of

concerns and seeks client/server technology to deal with them. Issues cited included:

- National Performance Review/redefinition of agency mission
- Federal downsizing and budgeting constraints
- Development of information highway; network design and limitations
- System/network capacity, performance and reliability issues
- Data standardization and access
- Requirements for and use of open systems
- Health care reform
- Organization issues, culture and buy-in
- Technology availability
- Standards development

In bringing technology solutions to the federal marketplace, vendors must understand these issues as constraints and opportunities and, where appropriate, relate their capabilities to the larger view of the IRM executive.



Survey Findings

Primary research surveys were conducted with participants from 22 agencies, including all major departments. This section summarizes survey participant responses relative to:

- Their agency's use of client/server architecture
- The scope and significance of client/server architecture to their agency's overall information systems usage
- How agencies plan to use client/server architecture in their efforts to re-engineer the business
- How agencies' new client/server-designed systems will be integrated with legacy operations
- To what extent open systems advantages will affect the design and use of client/server architecture
- The expected and realized benefits and advantages in using client/server architecture
- The expected and experience disadvantages in using client/server architecture
- Critical success factors in implementing client/server systems
- Obstacles to overcome in implementing client/server systems
- Vendor support needed to implement client/server systems
- Degree commercial off-the-shelf software will be used to implement client/server systems
- Development tools source to support client/server development efforts

- Platforms to be used for the development and operation of client/server systems
- Degree to which information technology expenditures are (and will be) directed to client/server development efforts
- Other issues and trends thought to be relevant to client/server in the federal sector in the coming five years

A

Use of Client/Server Architecture

Respondents were asked, "Is your agency currently using or planning to use client/server architecture in developing or operating its systems?"

Exhibit III-1 summarizes these responses, and the answers were categorized into one stage of development only.

EXHIBIT III-1

Client/Server Activity

Stage of Development Activity	Percent of Respondents
No Use Planned	—
Planning Development	33
Developing Applications	28
Implemented a Few Applications	28
Implemented Many Applications	11

N=21

Source: INPUT

This data shows all surveyed agencies were engaged in some stage of client/server development, and 39% of the respondents have implemented, at least, a few applications.

B

Scope and Significance of Client/Server Architecture

To determine the significance of client/server architecture relative to the direction for the agency, respondents were asked, "Would client/server systems be used to support:

1. Enterprise-wide systems

2. Broad functional- or program-related systems
3. Limited or certain isolated functional needs
4. Limited to only infrastructure need(s)
5. Only specialized application usage?"

The responses are represented in Exhibit III-2.

EXHIBIT III-2

Scope of Client/Server Implementation

Scope of Implementation	Percent of Respondents
Agency-wide	86
Broad Program	38
Limited Program/Specific Functional	28
Specialized Application Usage	—
Limited to Infrastructure Support	—

N=21

Source: INPUT

The responses dramatically show that client/server designs are used for the most significant needs of the agencies surveyed. The fact that client/server, as an implementation strategy, is supporting agency-wide and broad program activities underscores its importance. In no instance was it found that a client/server implementation was limited to specialized application or to infrastructure needs.

To determine the significance of client/server development to the mission of the agency, respondents were also asked, "To what degree would the development of client/server applications be coupled with re-engineering of the associated program or business process?" Responses are shown in Exhibit III-3 below (multiple responses were allowed.)

EXHIBIT III-3

Significance of Client/Server Development

Scope of Implementation	Percent of Respondents
New Applications Only	48
Re-engineering of Current Applications	67
Restructure of Functional Areas	76

N=21

Source: INPUT

This question was designed with the assumption that the frequency of client/server implementations would trend high to low from support to new applications, followed by the re-engineering of current applications, followed by support to the restructure of functional areas. However, responses to the question were generally the reverse of the expectations, illustrating as an operating concept that client/server goes beyond a technical concept and serves as an implementation strategy for changing the functional activities of agencies.

C**Integration With Current Operations and Legacy Systems**

To determine how client/server developments were implemented into the current operations of the agency, respondents were asked, "Does or will your client/server applications integrate with existing legacy systems using:

1. Not at all—will remain separate
2. Common networks
3. Common data access and exchange
4. Process interoperability?"

Exhibit III-4 summarizes the responses.

EXHIBIT III-4

Integration of Client/Server Applications with Legacy Systems

Integration of C/S Applications with Legacy Systems	Percent of Respondents
Separate Implementation	5
Common Network Usage	62
Shared Data Usage	76
Process Interoperability	19

N=21

Source: INPUT

Responses centered around integration of networks and data used by legacy systems with existing networks. Most respondents believed that shared data usage was the most important integration objective. Only 19% of the respondents believed their client/server implementation would interoperate with existing systems.

D**Importance of Open Systems for Client/Server Implementation**

To determine to what degree open systems advantages are influencing the client/server implementations, respondents were asked, "How important are open principles to your client/server development efforts?" Their responses are shown in Exhibit III-5.

EXHIBIT III-5

**Significance of Open System Principles
in Client/Server Applications**

Degree of Importance/Applicability of Open Systems Principles	Percent of Respondents
Required	48
Very Important	52
Somewhat Important	—
Not Important	—

N=21

Source: INPUT

The correlation of open systems principles and client/server was striking. Although only a few respondents indicated they were, to some degree, constrained by a standard for "openness," all believed open principles would be very important if not required in their client/server implementation.

E

Expected and Realized Benefits

When asked, "What benefits do you expect from client/server architecture?" respondents replied as shown in Exhibit III-6 (multiple responses were allowed).

EXHIBIT III-6

Expected Client/Server Benefits

Expected Benefits	Percent of Respondents
Operational Economics	48
Improved Data Availability	48
Better Exploitation of Desktop Capability	30
Improved Efficiency	15
Greater Flexibility	15
Better Performance	15
Improved User Satisfaction	5
Faster Development Time	5
Reduction in Paper Forms	5
Flatter Organization Structure	5

N=21

Source: INPUT

Expectations relating to operational economies, data availability and exploitation of desktop capability were leading responses. Operational economy appeared to correlate with open systems. Data availability and exploitation of desktop capability relate to the distribution of data and processing power characteristic of client/server designs.

To determine how the respondents thought about the realized versus expected advantages, respondents were asked, "What benefits have you actually realized from client/server

architecture?" Survey responses are shown in Exhibit III-7 below (multiple responses were allowed).

EXHIBIT III-7
Experienced Client/Server Benefits

Experienced Benefits	Percent of Respondents
Operational Economics	44
Better Performance	13
Better Exploitation of Desktop Capability	13
Improved Efficiency	13
Greater Flexibility	6
Improved User Satisfaction	6
Faster Development Time	6

N=21

Source: INPUT

Consistent with the benefits expected, the response of operational economies rated high. However, other experienced benefits cited were not significant.

F
Expected and Experienced Disadvantages

When asked, "What disadvantages do you expect or have you experienced using client/server architecture?" respondents replied as shown in Exhibit III-8 and Exhibit III-9 (multiple responses were allowed).

EXHIBIT III-8

Expected Client/Server Disadvantages

Anticipated Disadvantages	Percent of Respondents
Longer Development Cycle/Higher Development Costs	33
Reduced Control Over Data Access	25
Operational Volatility/Reliability	20
Higher Operational Costs	20
Learning Curve/Training Requirement	20
Organizational Impact	15
Performance Degradation	10
Lack of Standards	10
Isolation/Non-integration of Legacy Systems	5

N=21

Source: INPUT

Longer development time and reduced data control were leading responses. Other responses ranged over a variety of concerns.

EXHIBIT III-9

Experienced Client/Server Disadvantages

Experienced Disadvantages	Percent of Respondents
Higher Operational Cost (for distributed operation)	33
Reduced Network Performance	33
Increased Staffing Requirement	33

N=21

Source: INPUT

Experienced disadvantages focused on cost, performance and staff. However, these "disadvantages," in contrast to a centralized mainframe implementation, can be considered as characteristics common to a distributed operation.

G

Critical Success Factors for Client/Server Implementation

When asked, "What are critical success factors in implementing client/server systems?" respondents replied as shown in Exhibit III-10 (multiple responses were allowed).

EXHIBIT III-10

Critical Successful Factors

Critical Success Factors for C/S Implementation	Number of Responses
Effective Data Management (access, sharing, integrity and security)	8
User Buy-in/Involvement/Satisfaction	7
Reduction in Operating Costs	6
Availability and Use of Methodologies and Standards	6
Management Commitment and Budget Support	6
Adequate Training	3
Vendor Selection and Support	3
Use and User Interface	2
Open Systems Characteristics	1
Reduction in Development Cycle	1

Source: INPUT

No one factor was viewed as singularly significant to success of client/server implementations. Again, the data access/management and operational economies factors were frequent responses. In addition, user involvement and management commitment were considered very important for the success of client/server initiatives. Other factors, such as methodologies and standards, training, vendor selection and support illustrated the dependency on external resources. Interestingly, reduction in cycle was cited in only a very small percentage of responses, indicating a low expectation in this development.

H

Obstacles to Client/Server Implementation

When asked, "What are the obstacles to be overcome in implementing client/server systems?" respondents replied as shown in Exhibit III-11, as opposed to the previous query regarding critical success factors. The purpose of this question was to determine factors in the current environment which were problems or obstacles to client/server implementation.

EXHIBIT III-11

Client/Server Obstacles

Obstacles to C/S Direction	Percent of Respondents
Staff Attitudes (cultural barriers)	48
Funding/Infrastructure Investment	30
Learning Curve	24
Understanding of Business Functions	15
Integration with Existing Technology	15
Data Access/Integration Complexity	15
Organization Boundaries	10
Lack of Standards	5
Management Understanding and Acceptance	5
Impact on Installed Capacity	5

N=21

Source: INPUT

Staff attitudes, funding/infrastructure investment, learning curve and the understanding of business functions are barriers the organization must eliminate or substantially reduce. As indicated by obstacles such as understanding of business functions and data access/integration complexity, client/server implementation is recognized as more than a technological undertaking.

I

Source of Staffing Support

Responses to the question, "What will be the source of staffing support for the life cycle phases of your client/server projects?" are shown in Exhibit III-12.

EXHIBIT III-12

Staffing Support

Source of Staffing Support	Percent of Respondents
In-house Staffing	10
Vendor Staffing:	
• For Most Life Cycle Phases	80
• For All Cycle Phases	10

N=21

Source: INPUT

These responses show the dependence of client/server implementation on external staff support in virtually all phases of the life cycle. Respondents typically expressed the objective of post-implementation technology transfer to internal staff.

J

Source of Development Tools

Responses to the question, "What is or will be the source of development tools to support client/server development efforts?" are shown in Exhibit III-13.

EXHIBIT III-13

Software Support

Source of Software	Percent of Respondents
From In-house Sources	10
From Vendors:	
• Most Software	85
• All Software	5

N=21

Source: INPUT

Similar to source of staffing support, these responses show the dependence of client/server implementation on vendor-supplied software. This software includes development tools as well as the application system development.

K

Use of Commercial Off-The-Shelf Software

Responses to the question, "To what degree will commercial off-the-shelf software be used to implement client/server systems?" are shown in Exhibit III-14.

EXHIBIT III-14

Use of Commercial Off-The-Shelf Software

Intended Use of COTS	Percent of Respondents
Definitely	55
Probably	30
Possibly Not	5
Definitely Not	—
Not Sure	10

N=21

Source: INPUT

The significant majority (85%) of respondents believed they would use commercial off-the-shelf software for their client/server development again—illustrating not only the economy of development effort, but the dependency on external resources.

L

Type Of Platform Used

Questions were asked to determine the platform type for development and operational support for client/server efforts. Responses to the question, "What is the current and future platform type that will support client/server system development in your agency?" are shown in Exhibit III-15. Multiple responses were allowed.

EXHIBIT III-15

Development Platform Type

Platform Type	Percent of Respondents	
	Current	Future
Enterprise (Mainframe)	62	67
Department (Midsize)	62	58
Desktop (PC)	62	58
Unknown	--	10

N=21

Source: INPUT

The multiplicity of platform types is reflected in their combined percentages that exceed 100%, illustrating that development spans platform type.

Responses to the question, "What is the current and future platform type which will support client/server system operations in your agency?" are shown in Exhibit III-16. Respondents were allowed to cite multiple types.

EXHIBIT III-16

Operation Platform Type

Platform Type	Percent of Respondents	
	Current	Future
Enterprise (Mainframe)	43	62
Department (Midsize)	52	62
Desktop (PC)	3	48
Unknown	--	15

N=21

Source: INPUT

Few respondents indicated current use of the desktop as the operational platform, but 48% said it would be in the future. The large combined percentages for future platform usage (well more than 100%) reveal that a network of processors will be used.

M**Client/Server Funding Trend**

Responses to the question, "To what degree is information technology funding in your agency being redirected to client/server development efforts and how will these change in the future?" are shown in Exhibit III-17.

EXHIBIT III-17

Information Technology Funding

Redirection of Funding to C/S	Percent of Respondents
Current:	
• Low	5
• Moderate	45
• High	30
Future:	
• No Change	—
• Low	—
• Moderate	32
• High	55
• Unknown	14

N=21

Source: INPUT

These responses show the projected increase for client/server implementation funding in the future relative to its present levels. The combined "Current" moderate- and high-levels total 50%—within the next three years, the "Future" total is estimated to be 87%, representing a rate of change of 74%.

N**Other Factors Influencing Client/Server Usage**

To gain insight on factors that will affect the use of client/server, the question, "What other considerations do you believe are relevant to client/server architecture in the federal government in

the next five years?" was asked. Responses are shown in Exhibit III-18. Multiple responses were allowed.

EXHIBIT III-18

Factors Influencing Client/Server Usage

Influencing Factors	Percent of Respondents
National Performance Review/Redefinition of Agency Mission	40
Federal Downsizing and Budgeting Constraints	25
Development of Information Highway; Network Design and Limitations	20
System/Network Capacity, Performance and Reliability Issues	15
Data Standardization and Access	15
Requirements For and Use of Open Systems	10
Health Care Reform	10
Organization Issues, Culture, Attitudes, Buy-in	5
Technology Availability	5
Standards Development	5

N=21

Source: INPUT

Few of the factors cited were technical issues. The predominant factors related to the National Performance Review initiative, government downsizing and the information highway. The characteristics of client/server implementation, noted above as having significant scope of impact, were generally believed to relate to agency-wide plans and issues.

(Blank)



Findings and Recommendations

The findings of this survey indicate a significant transition underway to client/server architecture in the federal sector. The experience and benefits gained to date by federal IRM executives is significant, and their future planning is expansive. Many systems have been implemented and many more are under development. Client/server designs are exploited in conjunction with the restructuring of agency functional operations as well as the technical re-engineering of application systems.

The federal government has been challenged by executive initiatives to reinvent its operations and cut costs. The client/server revolution is viewed by IRM management as the way to downsize and reinvent as well as gain operational economies. This view is based on the technical advantages and cost reduction potential of client/server implementations. Further, this view appears to be greatly influenced by the general industry-wide client/server phenomenon and by the cost-cutting, downsizing mentality in and out of government. These influences will continue to affect federal decision-making in years to come.

A

General Observations

As reported in the survey findings, the potential for cost savings is a primary motivator for the IRM executive to adopt client/server architecture as the design for system operations. The development of reduced instruction set computers (RISC) and the continuing advances in microcomputer performance contribute, as a trend, toward smaller processors and the diminishing role of the mainframe. These technological factors, coupled with the general attitude for “downsizing” and “rightsizing” organizations

and their supporting infrastructures, set the stage for client/server architecture.

Another significant motivator is the reinvention of government operations as articulated by the National Performance Review initiative. This motivator corresponds to the interest in business process re-engineering so popular in the private sector. These motivating factors are discussed in more detail in the sections to follow.

The survey findings show that inhibitors to client/server usage include concerns about control (data and operational), increased demand on network capacity and support requirements resulting from a wider distribution of operations.

In contrast to these perceived disadvantages, the survey sought to determine what factors the agencies believed were obstacles, at least in their particular organizations, to a successful client/server implementation. Not surprisingly, staff attitudes were most frequently cited, by almost half the respondents. Other frequently noted obstacles included increased learning curves and required infrastructure investments.

Findings relating to the critical success factors for client/server implementation show client/server implementation must reduce operating costs of computing and network resources and must observe open principles. Further, implementations must integrate existing platforms and exploit desktop capabilities. User involvement and management commitment were cited as important ingredients for success.

Other findings of the survey included:

- Fifteen percent of the respondents believed that performance would be improved using a client/server architecture—of those respondents citing experience, 13% reported actual performance improvement.
- The use of open systems principles, if not standards, was generally required for all client/server undertakings.
- Integration with current networks and access to existing databases were common implementation objectives—integration with legacy systems was the rule rather than the exception.

- Thirty-three percent of the respondents believed that development times would be longer—only 6% believed that development times would be shorter.
- Lack of client/server design standards was not a significant inhibitor.

B

Recommendations

Individual findings and recommendations, relative to the most significant needs and issues identified by the survey, are cited below.

1. Restructuring of Operations**Finding:**

Client/server initiatives were thought of as key to instituting change in the operation of the agencies surveyed. Respondents strongly believed that agency functions must be understood to successfully implement client/server architectures. There was a high correlation of client/server planning to re-architecting functional processes. Most respondents indicated client/server applications would be used to implement restructured or re-engineered activities of their agencies.

Recommendation:

Client/server implementations must include user participation. Implementations that will support changes to operating functions should include a rigorous analysis of the functional activities. User staff must be a part of the analysis and implementation effort.

2. Need for Economies in Operational Costs**Finding:**

The expectation for economies in operational costs was consistently voiced as a primary client/server advantage. Achievement of cost reductions was also cited as a critical success factor. This expectation contrasts with that of development costs, which were generally expected to be higher with longer duration.

Recommendation:

Client/server implementations must be cost-effective and produce real, demonstrable economies. To be successful, implementations must address user needs, conserve computing and network resources and be implemented using open principles.

3. Downsizing of Operations and Platforms

Finding:

Operational cost savings, through client/server implementation, was a commonly held expectation. Respondents believed reductions would be made to resources presently devoted to operations and platform support. However, respondents with actual experience indicated there was an *increase* in support costs related to a more distributed operation.

Current use of the desktop as an operational platform for client/server implementations is minimal, but almost half the respondents said that, in the future, the desktop would be a component of their client/server implementation. Moreover, the large, combined percentage for future platform usage (more than 100%) suggests that a multiplicity of platforms will be used in a network of processors.

Recommendation:

The role of the desktop in the architecture should exploit its power and optimize its large installed base. Architectures for client/server implementations should integrate the power of installed desktops to maximize its overall capacity.

4. Concern About Control of Data and Operations

Finding:

The importance of control (or loss thereof) in client/server implementations was significant to the survey respondents. While respondents believed that client/server implementations would facilitate the access, sharing and exchange of data, there was also an issue of loss of control. Concern about this subject centered around data access, ownership and integrity.

Recommendation:

To fully exploit the architecture, client/server implementations must facilitate data sharing and interchange. Access to legacy system data should be a capability of a long-term data management strategy. Client/server implementations must provide data management solutions so that legacy and new systems share data with integrity over an interim period, while the data is migrated to new platforms.

5. Executive Commitment and Expectation**Finding:**

The benefits and growing popularity of client/server architecture have received much publicity. While executive management may not understand the technical concepts or the complexity of implementation required for the integration of client/server systems with existing operations, there is a definite expectation for reduced cost of operations. The survey results indicate that the perception of reduced costs is very significant as a motivator to implement client/server architectures. Given the current cost reduction climate in the federal sector, this perception appears to be driving management and users to adopt client/server structures in conjunction with efforts to cease functional operations and re-engineer existing systems.

However, the success of client/server implementations depend on more than architectural concepts. In most cases, adoption of a client/server strategy will mean significant changes to the agency's infrastructure relative to its hardware, software and tools. These changes impact staff capabilities and training needs. Further, as experience in the private sector has shown, without specific metrics for setting expectations and measuring results, the success of client/server initiatives will suffer.

Recommendation:

The survey findings showed that IRM management believed that senior management commitment was a significant critical success factor. The concern was expressed that the complexity of client/server developments and integration with existing systems was not well understood by senior management. In this regard, the importance of education should be recognized. This need is

especially true for vendors that have a significant stake in the outcome of large implementations. In such instances, the partnership aspects of the vendor/agency relationship should be emphasized.

Vendors should be mindful of the high expectations executive management has, relative to the payback of client/server directions. It seems to be understood that client/server development will require fundamental changes in the agency's technology and the skills of its in-house staff. Accordingly, increased development time and costs are accepted. However, client/server is sold based on benefits to the business and reduced equipment costs for smaller processors. Vendors should proceed carefully to ensure expectations are reasonable. This may require time and money to invest in expectation setting activities and the deployment of metrics for management feedback.

6. Funding Trends

Finding:

Relative to present funding levels, respondents indicated a rapid redirection of funds to client/server implementations. The combined current moderate- and high-level of funding totals 50% for client/server implementations. Within the next three years, the comparable total is estimated at 87%, which equates to a growth rate of 74%.

Recommendation:

Clearly, relative to total information technology budgets, funding for client/server implementations is rapidly increasing. Accordingly, vendors should adapt their capabilities to client/server architectures. Of course, such a transition, in the form of software redesign and repackaging, is already underway. However, it should also be recognized that open systems principles and the need to interface with existing legacy operations is exceedingly important to the federal sector. Old systems will rarely be thrown away; instead, they will be adapted to interface with new client/server systems. Vendors whose products facilitate such interfaces will be more cost- and time-competitive in integrating with existing systems.

7. External Support Needs

Finding:

Respondents believed that client/server implementations would require new or significant changes to currently installed operational platforms, software and supporting tools—almost all believed they would need vendor support for staffing and tools. Responses showed the dependence on external staff support in virtually all phases of the life cycle. Post-implementation technology transfer to internal staff was cited as an objective.

Responses also revealed the need for vendor-supplied software. This need included development tools and application systems. A very high percentage of the respondents believed they would use commercial off-the-shelf software and reduce development costs.

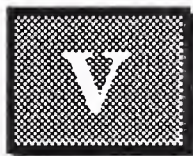
Other needs identified by the survey, such as methodologies and standards, training and the importance of vendor selection and support, further illustrate the dependency on external resources.

Recommendation:

The federal sector is just beginning its downsizing and reinventing phase. Increasingly, client/server implementations will support these activities and be used as existing systems are re-engineered. Vendor support will be necessary for these efforts, from business process re-engineering through staffing for program development.

Tools will be needed to support front-end requirements analysis efforts, use database management systems for restructured data implementations, develop graphical-user interfaces for desktop client programs and generally provide productivity in all phases of the new GUI, windowed desktop development environment. In the operational arena, a staggering array of new systems management tools will be needed to support the operations of the client/server operating environment. Professional services staff will be required to support these activities and assist in the technology transfer.

(Blank)



Market Forecast

As the results of this survey show, the federal IT marketplace is rapidly adopting client/server architecture as a primary strategy to meet new mission objectives. Economic dynamics are driving changes in the way agencies operate. The forecasts presented below provide an overview of the federal IT market for the next five years and how client/server implementations will command an increasing share of this projected growth.

Industry-wide, the projected expenditures for client/server implementations is overwhelming. Use of client/server architecture in the federal sector will proceed at a slower pace, but as the survey findings indicate, client/server implementations will gain an increasing share of federal IT expenditures. At perhaps no more than 6% of the total contracted portion of the federal IT budget in FY1994, client/server is forecast to grow at 27% CAGR through FY1998 to 13% of the IT budget (see Exhibit V-1). This forecast is based on plans to implement client/server technologies reported in the survey. Based on the projections of total federal software expenditures provided in Exhibit V-2, by FY1998 expenditures on client/server implementations in federal agencies will exceed \$3 billion.

EXHIBIT V-1

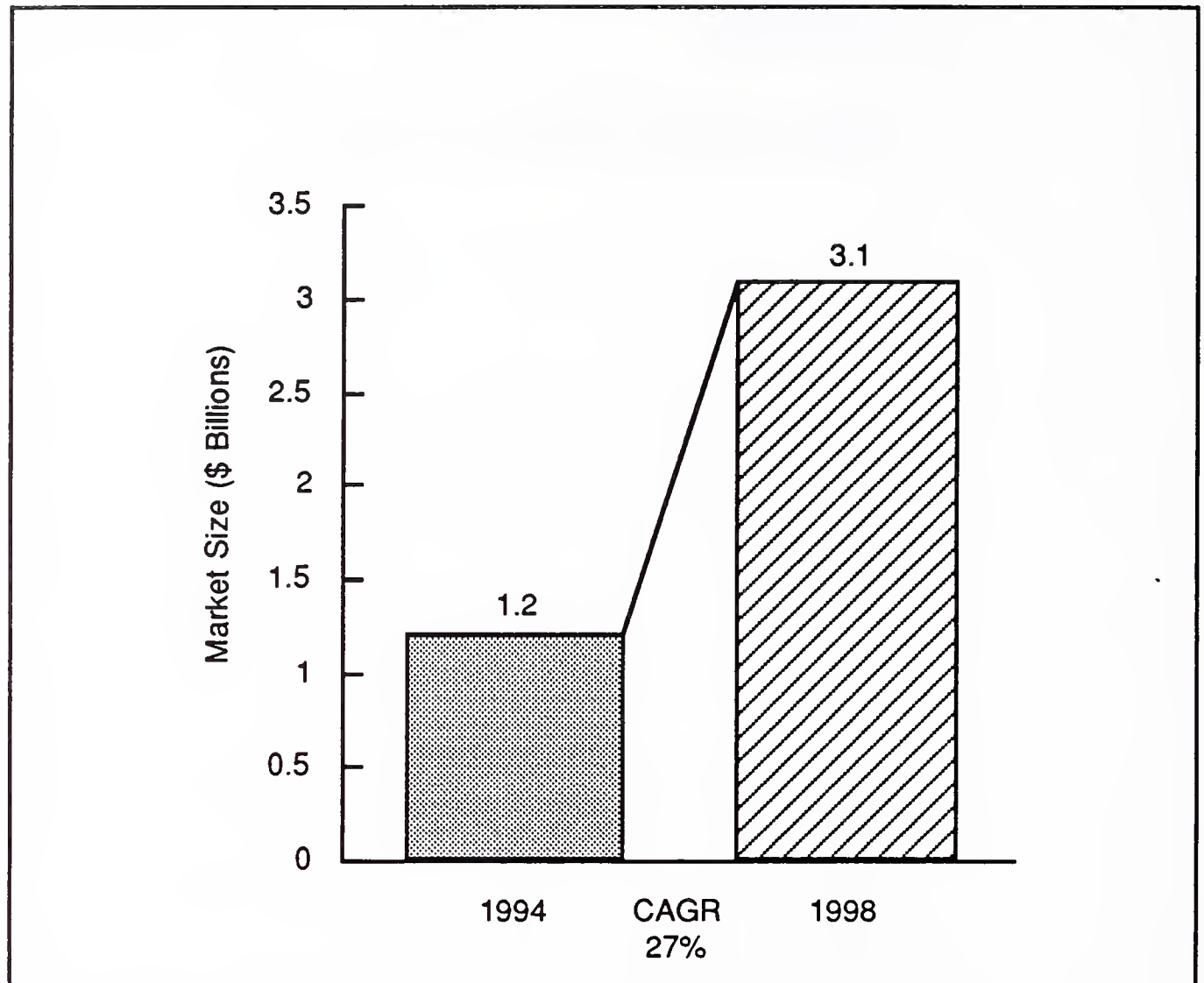
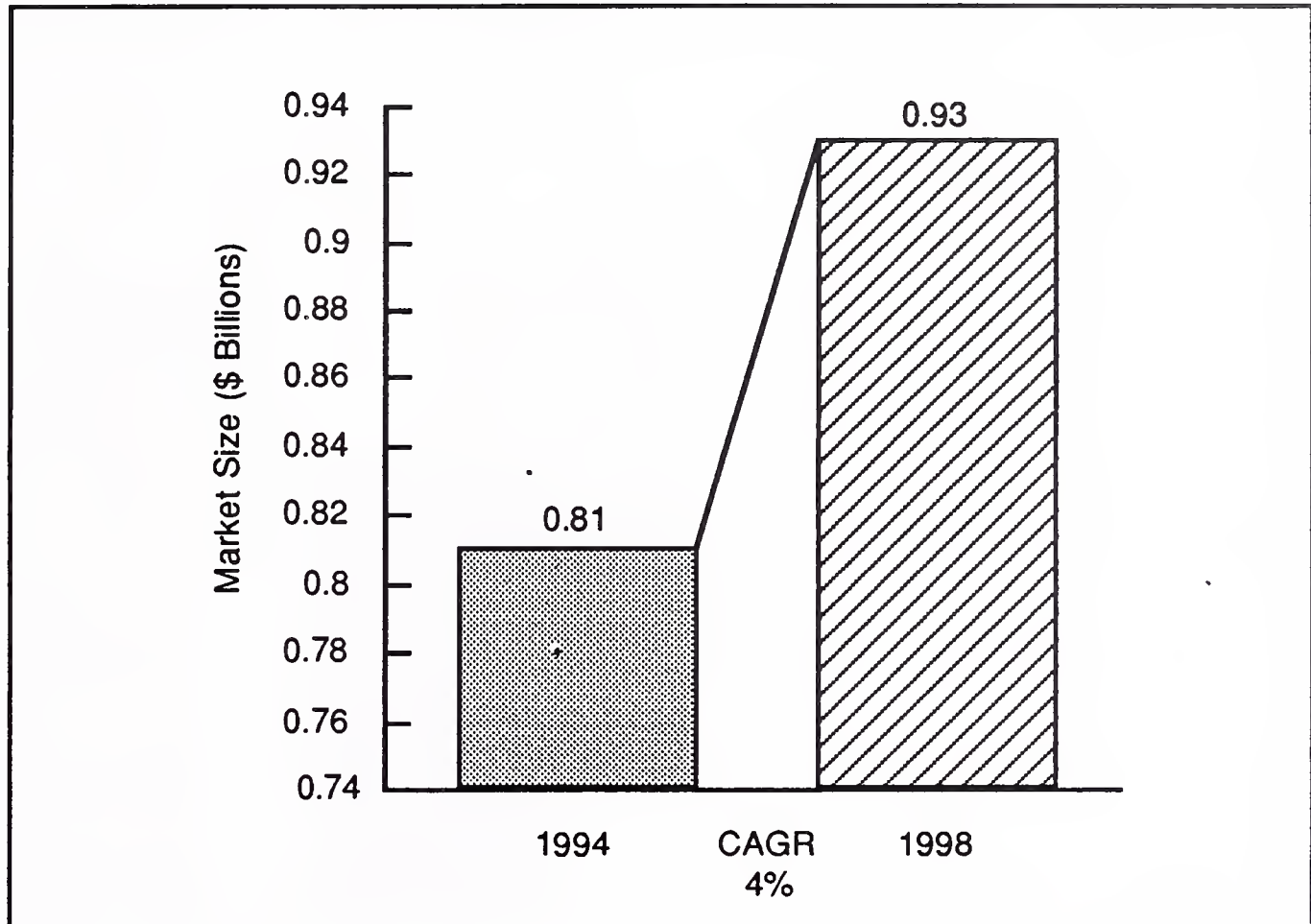
Federal Government Client/Server Market Growth

EXHIBIT V-2

Projected Expenditures for Software Including Acquisition and Licenses



Software that provides client/server integration is key to a successful implementation, and expenditures in this segment may indicate real growth potential for client/servers. With the modest growth rate (4%) reported by federal agencies in budgets for software products (Exhibit V-2), as opposed to software development, growth in systems integration and professional services will hold the key to client/server implementation. With growth rates of 9% CAGR for contracted software development (Exhibit V-3) and 8% CAGR for the professional services segment of system integration (Exhibit V-4), more robust growth can be expected. (The overall federal IT market is forecast to grow at 6% CAGR.)

EXHIBIT V-3

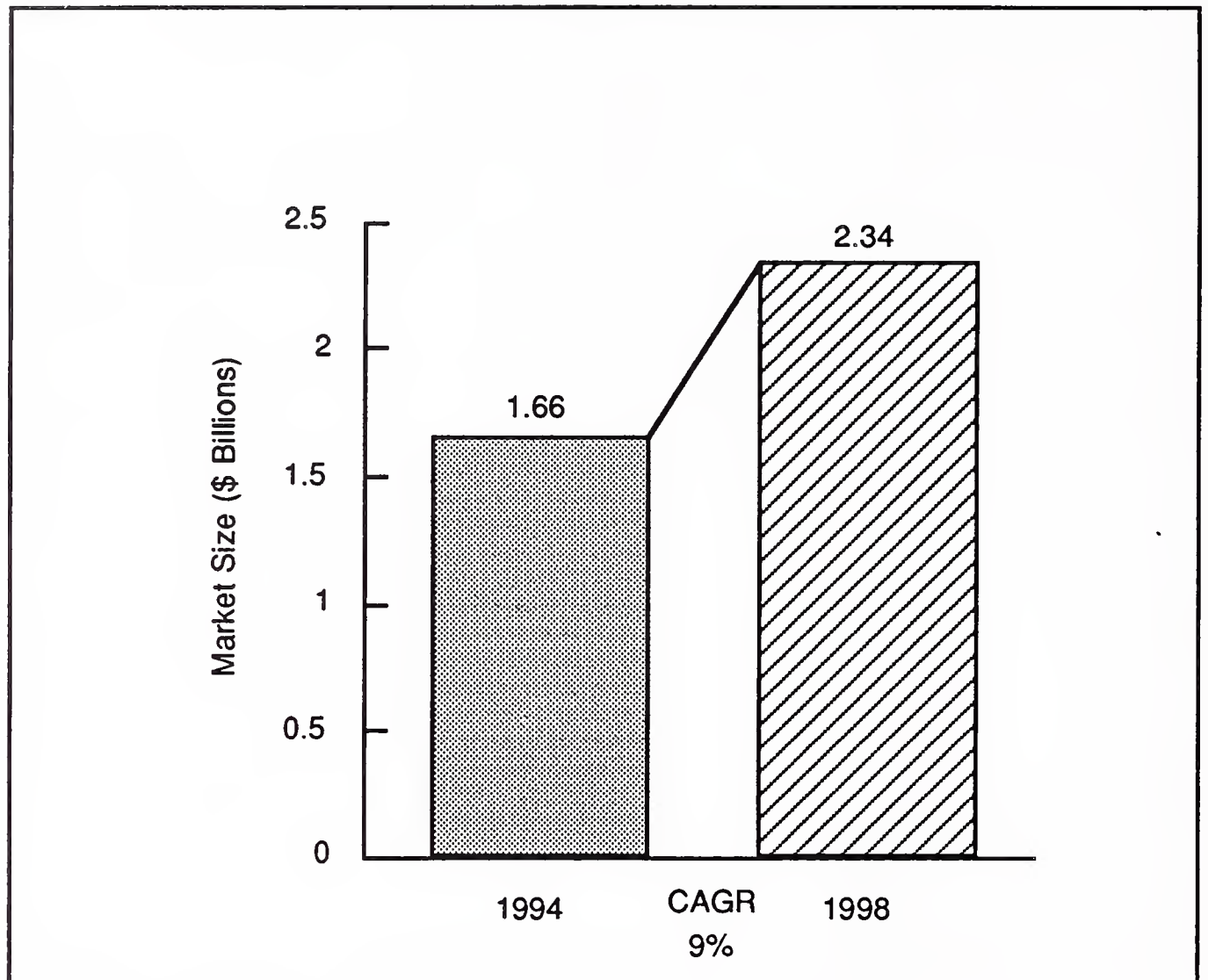
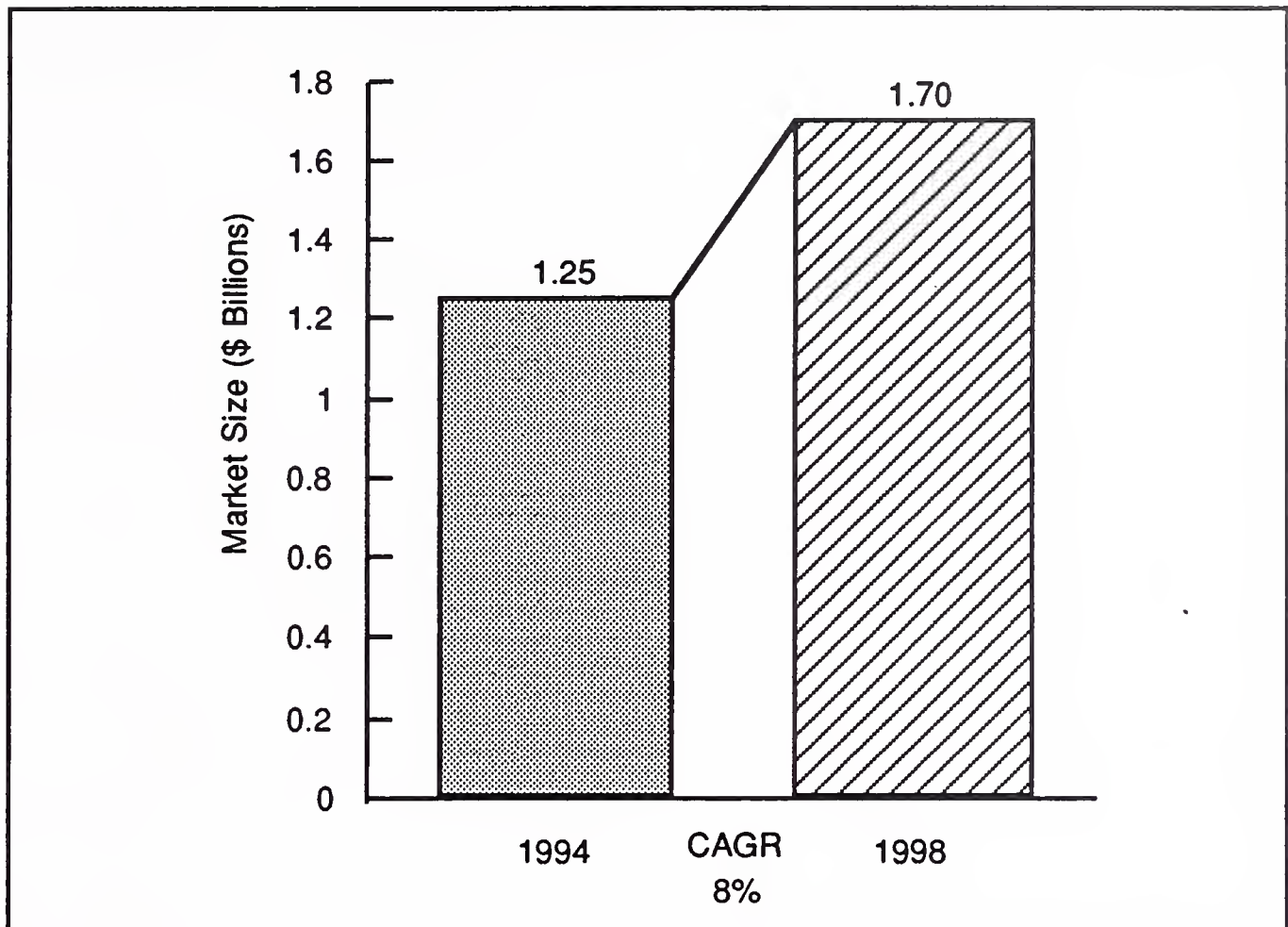
**Forecast Expenditures for Software Development
through Professional Services**

EXHIBIT V-4

Forecast Expenditures for Systems Integration



A sizable gap appears between projected implementation of client/server architecture (27% CAGR), in the view of program planners and the numbers forecast (9% CAGR) from the federal government IT budgets. Two key elements will close this gap. First, the administration will have to indicate higher spending levels for IT in its plans to re-engineer government. Secondly, agencies will have to recast their programs' IT needs based on client/server solutions. Again, re-engineering government will be the driver. Even if overall spending levels do not increase significantly (greater than the current 6%), federal agencies will have to leverage more of their existing technologies with new client/server engineering to gain operational benefits expected.

Leveraging existing technologies can take advantage of a number of existing commercially available client/server tools. These tools are characterized in Exhibit V-5.

EXHIBIT V-5

Client/Server Implementation Tools

- Team Engineering Tools
- Re-engineering Tools
- CASE Analysis and Design Tools
- AGL Development Environments
- Graphic Laser Interface Development Tools
- Database Management Tools
- Data Access Tools
- Decision Support Systems
- Systems Management Products
- Network Management Products

Exhibits V-6 through V-15 list a sampling of commercial tools already available. For the next few years, based on client/server architecture demands, these tools will evolve in capability and new tools will be added to the market.

EXHIBIT V-6

Representative Team Engineering Tools

Vendor	Product
Bachman Information Systems	Bachman/Shared Work Manager
Cadre Technologies	Teamwork
Case Methods Development	Synergy
Computer Systems Advisors	POSE
Digital Equipment	CDD/Repository
Hewlett-Packard	HP/Soft/Bench
Interactive Development Environments	Software Through Pictures
Intersolve	APS
KnowledgeWare	Application Development Workbench
LBMS	Systems Engineer
Matesys	ObjectView
Oracle	Oracle Case Tools
Popkin Software & Systems	Systems Architect
Powersoft	PowerBuilder Enterprise

EXHIBIT V-7

Representative Re-engineering Tools

Vendor	Product
Andersen Consulting	Foundation
Bachman Information Systems	Bachman Re-engineering Product Set
Cadre Technologies	DB Designer; Ensemble
Interactive Development Environments	C Development Environment
InfoSpan	InfoSpan/Case-Span Repository Manager
Intersolve	APS
KnowledgeWare	ADW
Seer Technologies	HPS Case
Texas Instruments	IEF/RE
Unisys	Linc

EXHIBIT V-8

Representative CASE Analysis and Design Tools

Vendor	Product
Andersen Consulting	Foundation for Cooperative Processing
Bachman Information Systems	Bachman Database Design
Cadre Technologies	Teamwork
Cooperative Solutions (now part of Bachman)	Ellipse
Interactive Development Environments	Software Through Pictures
Information Engineering Systems	IE/Advantage
Intersolve	Excelsior
KnowledgeWare	Application Development Workbench
LBMS	Systems Engineer
Oracle	Oracle*CASE
Popkin Software & Systems	System Architect
Texas Instruments	IEF

EXHIBIT V-9

Representative 4GL Development Environments

Vendor	Product
Ask/Ingres	Admins/V32, Ingres
Cincom Systems	Mantis, Supra
Cognos	PowerHouse
Computer Associates International	CA-Ramis
DataEase International	DataEase
Empress Software	Empress
Gupta	SQLWindows
Information Builders	EDA/SQL
JYACC	JAM
Oracle	Oracle
Progress Software	Progress
Software AG	Natural
Sybase	Sybase: SQL Toolset
Uniface (merged with Compuware)	Uniface
Unify	Accell/SQL

EXHIBIT V-10

Representative GUI Development Tools

Vendor	Product
Andersen Consulting	Foundation
Digitalk	Smalltalk/V
Easel	Easel Workbench
Gupta	SQLWindows
Informix Software	Informix-4GL
JYACC	JAM
KnowledgeWare	Flashpoint; ObjectView
LBMS	GUI Engineer
Liant Software	C++/Views
Microsoft	Visual Basic
Mozart Systems	Mozart
Neuron Data	Open Interface
Novell	AppWare
ParcPlace Systems	Objectworks/Smalltalk
Powersoft	PowerBuilder, PowerMaker
Uniface	Uniface UPI
Visix Software	Looking Glass

EXHIBIT V-11

Representative Database Management Systems

Vendor	Product
ASK/Ingres	Ingres
Borland International	Paradox; Interbase
Cincom Systems	Supra
Cognos	Starbase
DataEase International	DataEase
Digital Equipment	Rdb
Gupta	SQLBase
IBM	DB2
Information Builders	Focus; EDA/SQL
Informix	Informix
Microrim	R:base
Microsoft (with Sybase)	SQL Server
Must Software	Nomad
Oracle	Oracle
Progress Software	Progress
Software AG	Adabase
Sybase	Sybase

EXHIBIT V-12

Representative Data Access Tools

Vendor	Product
Borland International	Paradox SQL Link
Cognos	PowerHouse
Gupta	SQL Gateway
Information Builders	EDA/SQL
Natural Language	NLI Gateway
Oracle	SQL Connect
Progress Software	Progress
Sybase	Sybase SQL Server
Unify	Accell/SQL

EXHIBIT V-13

Representative Decision Support Systems

Vendor	Product
Borland International	InterBase
Cincom Systems	Supra
Cognos	PowerHouse
Gupta	SQL Gateway
Information Builders	Focus
Must Software	Nomad
Progress Software	Progress
SAS Institute	SAS Systems: SAS EIS
Software AG	Natural: Super Natural
SPSS	SPSS
Sybase	Replication Server
Uniface	Uniface
Unify	Accell/SQL

EXHIBIT V-14

Representative Systems Management Products

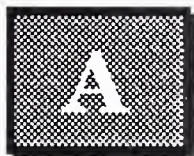
Vendor	Product
Candle	Omegacenter
Computer Associates International	CA-Unicenter
Digital Equipment	Data Center Manager
Hewlett-Packard	LaserRX
Legent	Open Systems Management
Open Vision	Open V*OPSS

EXHIBIT V-15

Representative Network Management Products

Vendor	Product
AIM Technology	SharpShooter
AT&T	AccuMaster Integrator
Boole & Babbage	Net/Command
Cabletron Systems	Spectrum
Candle	Omegacenter
Cisco Systems	NetCentral
Digital Equipment	DECmcc Director
Hewlett-Packard	HP OpenView System Manager
IBM	NetView; LAN Station Manager
Microsoft	LAN Manager
Novell	LANalyzer; NSM
Sun Technology Enterprises	SunNet Manager
SynOptics	Lattisnet
Systems Center	Net/Master
3Com	3Com View Builder

(Blank)



List of Agencies and Survey Respondents

Lawrence Barrett
Senior IRM
SBA
Washington, D.C.

Andrew Boots, IRM
Dept. of Justice
Washington, D.C.

Leonard Bourget, IRM
VA Hospital
Washington, D.C.

Kay Brinkmeyer
Systems Policy Staff
Dept. of Justice
Washington, D.C.

Steve Bryant, IRM
Treasury Dept.
Washington, D.C.

Otto Doll, IRMS
GSA
Washington, D.C.

W. Irvine, IRM
Internal Revenue Service
Washington, D.C.

CDR Dan Kelly
FMSO
Norfolk, VA

Robert Kidwell
Chief, IRM Staff
NOAA
Rockville, MD

Sara Jane League
Senior IRM
DISA
Washington, D.C.

Kenneth Mills
Assistant Director
IRM Policy
Bureau of Labor
Washington, D.C.

Bryan Moore
Director of Plans and Programs
DISA
Arlington, VA

Bruce Moscoe, IRM
HCFA
Ellicott City, MD

Ron Nervitt
Senior IRM
Financial Management Service
Hyattsville, MD

Don Peterson
Human Resources Development
Office of Personnel Management
Washington, D.C.

Capt. Rossler
National Computer Telecommunications Command
Navy

Leon Sanchez
Chief, Policy and Planning
Public Health Services
Rockville, MD

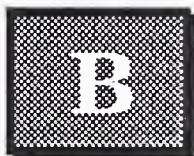
Dr. Fred Schuyler
Office of Information Management
Dept. of Energy
Washington, D.C.

Tom Thompson
Health and Human Services
ASMB/OIRM
Washington, D.C.

Robert Woods
Dept. of Veterans Affairs
DAS for IRM (045)
Washington, D.C.

Paul Wohlleben
Deputy Director
Office of IRM
Environmental Protection Agency
Washington, D.C.

(Blank)



Related INPUT Reports

Agency Recompete Practices in SETA and SO Contracts

Defense CIM Information Services Market

Federal Agency Recompete Practices

Federal Computer Equipment Market, 1991-1996

Federal Computer Security Market, 1992-1997

Federal Education and Training Market, 1990-1995

Federal Electronic Commerce/EDI Market

Federal Electronic Imaging Markets, 1991-1996

Federal Equipment Maintenance Market, 1990-1995

Federal Financial Systems Market, 1990-1995

Federal Geographic Information Systems Market, 1991-1996

Federal High-Performance Computing Market

Federal Information Systems and Services Market, 1992-1997

*Federal Information Technology Procurement Program,
Procurement Analysis Reports*

Federal Market Issues, 1991:

- *Uncompensated Overtime*
- *Federal 8(a) Programs*

- *Federal Anti-Drug Program*

- *GSA Schedule Practices*

Federal Network Management Market, 1991-1996

Federal Professional Services Market, 1991-1996

Federal Software and Related Services Market, 1991-1996

Federal Systems Integration Market, 1992-1997

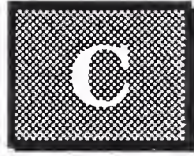
Federal Telecommunications Market, 1992-1997

High-Performance Computing in the Federal Market

Federal Information Systems and Services Market: FY 1993-FY 1998

Object-Oriented Technologies in the Federal Market: 1993

Client/Server Market Analysis, 1993-1998



Questionnaires

A

Survey Letter

November 3, 1993

Dear Agency Official:

Recently, INPUT distributed to participating federal agency IRM officials a summary of its findings from research conducted into object-oriented technologies in federal agencies. If you would like to distribute a copy to your staff, please give me a call.

As part of its continuing program to educate vendors regarding federal agency information technology requirements, INPUT is now examining the imaging market and the client/server market. Various technologies offer potential benefits in aiding agencies who are moving in either of these directions. Vendor awareness of federal agency perceptions, and other specific issues within federal agency programs, is important if agencies want to take best advantage of available capabilities in the marketplace.

We would like to include your organization's activities and interests in each of these markets, and in turn, to inform you of the activities and interests in other federal agencies. Sharing of experiences and solutions between users and suppliers offers a means to leverage development costs in today's restricted spending. Your organization's participation would be important to developing the best overall descriptive information of the imaging and client/server environments in the federal government.

A senior research analyst will be calling your office in the next few days to get the names of the most appropriate officials on your staff to assist in collecting the necessary information. I anticipate

that no more than fifteen minutes would be required to complete subsequent telephone interviews. As always, interviews are treated as confidential. Only summary information is released to the public; agency officials will not be identified.

Thank you in advance for your cooperation.

Sincerely,

Robert W. Deller, Ph.D.
Vice President

B

Questionnaire

INPUT, Inc. Client/Server Questionnaire — p.1

December 1993

Interviewee: _____ Organization: _____ Date: _____

Please provide your mailing address for your copy of the Survey Report:

1. Is your organization currently using or planning on using client/server architecture to develop any of its systems?

a. no • _____

b. planning to — how many projects? _____

c. currently using client/server
how many projects? _____

d. have already implemented applications
—one application _____
—several applications _____
—many applications _____

2. Do you see client/server as an architecture to be used in the support of:

a. enterprise-wide functions _____

b. broad functional or program related needs _____

c. limited or more isolated functional needs _____

d. only limited infrastructure need(s) _____

e. other (please explain on separate page) _____

3. How has/will your organization use client/server architecture for system development projects?

a. new applications only _____

b. re-engineering of existing systems _____

c. re-architecture of existing functional areas and applications _____

4. How will client/server usage integrate with existing (legacy) systems?
- a. not at all—will remain separate _____
 - b. common networks _____
 - c. common data access and exchange _____
 - d. process interoperability _____
5. How important are open systems advantages (scalable, extensible, interoperable, portable) to your organization vs. proprietary system limitations?
- a. required _____
 - b. very important _____
 - c. somewhat important _____
 - d. not important _____
- 6a. Based on your organization's experience to date, what advantages do/did you anticipate and have you actually experienced? (examples: operations performance, time/cost savings in
- Advantages Anticipated:
- 1. _____
 - 2. _____
 - 3. _____
 - 4. _____
- Advantages Experienced:
- 1. _____
 - 2. _____
 - 3. _____
 - 4. _____
- 6b. Based on your organization's experience to date, what disadvantages did you anticipate and have you actually experienced? (examples: operations performance, time and/or cost savings in
- Disadvantages Anticipated:
- 1. _____
 - 2. _____
 - 3. _____
 - 4. _____
- Disadvantages Experienced:
- 1. _____
 - 2. _____
 - 3. _____
 - 4. _____

7. What are the critical success factors which must be addressed to successfully use client/server architecture in future systems projects? (examples: assimilation of new technology, definition and adherence to methodologies/standards, availability/use of CASE development tools, vendor support, internal understanding and acceptance)
1. _____
 2. _____
 3. _____
 4. _____
8. What obstacles do you believe must be overcome to successfully implement client/server architected applications? (examples: cultural issues, staff learning curve, adaptability of ongoing legacy systems, cost of new technology)
1. _____
 2. _____
 3. _____
 4. _____
9. In your client/server projects, in what life cycle phase/activities will your organization need vendors support?
- | | staffing | software |
|---|----------|----------|
| systems planning (supplying the architecture) | _____ | n/a |
| requirements analysis (determining needs) | _____ | _____ |
| systems design (technical specification) | _____ | _____ |
| systems development (programming) | _____ | _____ |
| systems implementation | _____ | _____ |
| systems operation | _____ | _____ |
| functional operation (operating the program) | _____ | n/a |
10. Do you expect to make use of commercial off-the-shelf software in client/server applications?
- Definitely _____
- Probably _____
- Only possible _____
- Probably not _____
- Definitely not _____

11a. Presently, what is the present source of software tools supporting your client-server development projects?

	in-house	vendor
Requirements Analysis phase	_____	_____
Design phase	_____	_____
Build phase	_____	_____
Other needs (please explain)	_____	_____

11b. In the future, what will be the source of software tools to support client-server development projects?

	in-house	vendor
Requirements Analysis phase	_____	_____
Design phase	_____	_____
Build phase	_____	_____
Other needs (please explain)	_____	_____

12a. What platforms are being / will be used to support the development of your client/server applications? How will this change in the future? (indicate degree of overall use by specifying low, moderate, significant)

	used now	in future
Enterprise	_____	_____
Department	_____	_____
Desktop	_____	_____

12b. What platforms are being / will be used to support the operation of your client/server applications? How will this change in the future? (indicate degree of usage specifying low, moderate, significant)

	used now	in future
enterprise	_____	_____
department	_____	_____
desktop	_____	_____

13. Does your organization have a fixed definition of your client/server architecture?

Yes	_____
No fixed architecture planned	_____
Architecture planned but not yet defined	_____
Architecture will be defined for each application	_____
Architecture will remain undefined	_____

If you have defined your architecture, please describe it by indicating what roles your architecture assigns to client and server for the functions of presentation, data management, process, and communications management. Indicate to

what degree client and server support each function by specifying none, some, most, all.

	Client	Server
User interaction/presentation	_____	_____
Process	_____	_____
Data management	_____	_____
Communications management	_____	_____

What platform(s) is/will be used to support client and server functions?

	Client	Server
Mainframe	_____	_____
Minicomputer/LAN	_____	_____
Desktop	_____	_____

14. Relative to your present and forecasted technology expenditures, how are IT expenditures being apportioned to projects using client/server architecture? Indicate the rate of change by specifying none, low, moderate, or high

IT Budget Component	Present	1-3 Years	>3 Years
Hardware Funding	_____	_____	_____
Software Funding	_____	_____	_____
Network Funding	_____	_____	_____
Personnel Funding	_____	_____	_____

15. What other considerations (problems, opportunities, trends, etc.) do you believe are relevant to client/server architecture in the federal government in the next five years?

1. _____
2. _____
3. _____

Report Quality Evaluation

To our clients:

To ensure that the highest standards of report quality are maintained, INPUT would appreciate your assessment of this report. Please take a moment to provide your evaluation of the usefulness and quality of this study. When complete, simply fold, staple, and drop in the mail. Postage has been pre-paid by INPUT if mailed in the U.S.

Thank You.

1. Report title: ***Client/Server Trends in the Federal IT Market: 1994*** (MA3)

2. Please indicate your reason for reading this report:

- | | | |
|---|---|---|
| <input type="checkbox"/> Required reading | <input type="checkbox"/> New product development | <input type="checkbox"/> Future purchase decision |
| <input type="checkbox"/> Area of high interest | <input type="checkbox"/> Business/market planning | <input type="checkbox"/> Systems planning |
| <input type="checkbox"/> Area of general interest | <input type="checkbox"/> Product planning | <input type="checkbox"/> Other _____ |

3. Please indicate extent report used and overall usefulness:

	Extent		Usefulness (1=Low, 5=High)				
	Read	Skimmed	1	2	3	4	5
Executive Overview.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Complete report.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Part of report (____ %).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. How useful were:

- | | | | | | |
|-----------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Data presented | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Analyses | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Recommendations | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

5. How useful was the report in these areas:

- | | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Alert you to new opportunities or approaches..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cover new areas not covered elsewhere | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Confirm existing ideas | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Meet expectations..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

6. Which topics in the report were the most useful? Why? _____

7. In what ways could the report have been improved? _____

8. Other comments or suggestions: _____

Name

Title

Department

Company

Address

City

State

ZIP

Telephone

Date completed

Thank you for your time and cooperation.

M&S 633/01 3/93

INPUT

FOLD HERE



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

First Class Mail Permit No. 9070 Vienna, VA

POSTAGE WILL BE PAID BY ADDRESSEE

*Attention: Marketing Department***INPUT****1953 Gallows Road, Suite 560****Vienna, VA 22182-9793**

FOLD HERE

